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THE

ONTARIO WATER RESOURCES

COMMISSION

WATER QUALITY SURVEY

of the

ST. LAWRENCE RIVER

from

QUEBEC BOUNDARY TO KINGSTON

TD
380
.S75
1965
MOE

1962 to 1965

REP. 69

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Report on a water quality
survey of the St. Lawrence River
from Quebec boundary to
Kingston.

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THE
ONTARIO WATER RESOURCES
COMMISSION
REPORT ON
a
WATER QUALITY SURVEY
of
THE ST. LAWRENCE RIVER
from
QUEBEC BOUNDARY TO KINGSTON

Division of Sanitary Engineering
1962 to 1965

Report on a
WATER QUALITY SURVEY
of the
ST. LAWRENCE RIVER FROM THE
QUEBEC BOUNDARY TO KINGSTON

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Report on a
WATER QUALITY SURVEY
from
QUEBEC BOUNDARY TO KINGSTON

INTRODUCTION

This report will attempt to correlate the results of samples of the waters of the St. Lawrence River from the Quebec boundary to the City of Kingston, a distance of 146 miles, and major tributaries thereof in the vicinity of their points of discharge, which were collected during 1962-3-4 and part of 1965, by staff of the Ontario Water Resources Commission. The samples from the river and in 1962-3 from the tributaries were collected as part of routine water quality surveys.

In 1964, more comprehensive water quality monitoring of the tributaries and selected points on the river involving a program of regular year round collection of samples for detailed analyses was initiated to supplement the routine water quality surveys. For the purpose of this report the pertinent results available from this program are included. In addition to the results of samples collected by Commission staff, this report also includes laboratory raw water quality results of samples collected by personnel at specific water works.

The laboratory results of the samples as discussed in the body of the report are tabulated in the appended Tables I,

II and III. The results are listed in Table I in terms of bacteriological, chemical and physical qualities, which are of primary importance in water pollution control programs; in Table II in terms of nitrogen and phosphate values, which are of significance in nutritional and fertility studies of surface water; and in Table III in terms of chemical analyses relevant to drinking water quality.

The significance of the laboratory analyses employed to assess the various parameters of pollution and water quality are given in the appendix.

In addition to general information on the St. Lawrence River in the body of the report, information related to stream flows during the period covered as well as water and sewage works data of significance to the St. Lawrence River are included in appended Tables IV, V and VI respectively.

A map showing the approximate sampling locations and relevant mileages is attached to the report.

ST. LAWRENCE RIVER WATERSHED

General

The entire Great Lakes Watershed upstream of the Moses-Saunders power dam at Cornwall is comprised of 296,000 square miles. The drainage area north of the St. Lawrence River between Kingston and the Quebec boundary and tributary to the north bank of the river in this area would approximate 2000 square miles.

This area is bounded by four major drainage areas namely: on the west by the Napanee watershed, on the north by the Rideau watershed and also the South Nation River and on the east by the Beaudette River which empties into the St. Lawrence River approximately one mile east of the Quebec boundary.

Several rapids sections in the river were eliminated by the creation of Lake St. Lawrence, through the construction of the Saunders Dam, during the Seaway development period. Major shoreline alterations were effected from the City of Cornwall as far upstream as the Village of Iroquois. The control dam at Iroquois regulates the levels of Lake Ontario and the river downstream to this point.

Smaller river-front communities were relocated during the "Seaway Era" on new sites and were provided with modern water and sewerage facilities.

HYDROLOGY

With reference to the appended Table IV the average, maximum and minimum flow as recorded at the Moses-Saunders power dam by the Hydro-Electric Power Commission of Ontario in 1962, 1963 and 1964 were respectively 203,774 cubic feet per second (cfs); 234,323 cfs and 177,809 cfs.

CLIMATE

The pertinent drainage area of the St. Lawrence River lies along the path of many of the low pressure areas which sweep

across the northern part of North America from west to east. This results in stormy changeable weather with mild variation in temperature. The average annual temperature is approximately 45° Fahrenheit.

LABORATORY RESULTS

Water Pollution Control Aspects

As indicated previously the parameters used most commonly for determining levels of pollution are coliform counts, biochemical oxygen demand, solids content or turbidity, with occasional dissolved oxygen determinations and the corresponding temperatures.

With reference to Table I, intermittent or consistent pollution patterns are indicated at the following sample point locations. In each instance, explanatory comments are provided.

- | | |
|----------------|--|
| <u>SL 13.0</u> | The intermittent pattern of high coliform counts at Charlottenburgh Park might be attributed to seasonal conditions of profuse weed growths entraining upstream pollution contributions, together with increased temperatures. |
| <u>SL 21.7</u> | The high coliform count at the downstream boundary of the City of Cornwall reflects the influence of untreated sanitary and industrial waste flows from the City of Cornwall. |
| <u>SL 22.0</u> | The intermittent pattern of pollution at this point reflects untreated sewage flows from the City of Cornwall. |
| <u>SL 22.8</u> | The high coliform count recorded at this point is the direct result of a municipal sanitary sewer discharge. |

- SL 22.9 The high 5-day BOD and coliform count reported at this point reflect the lack of treatment for industrial waste from a textile firm.
- SL 22.91 The high 5-day BOD and coliform count reported at this point reflect the lack of treatment for industrial waste from a textile firm.
- SL 22.92 The high coliform counts at this point are the result of untreated sanitary sewage discharges.
- SL 23.02 The pattern of high coliform counts at this point is the result of untreated sanitary sewage flows from a municipal sewer outfall.
- SL 23.1C The high coliform count recorded at this point was not confirmed in later sampling.
- SL 24.91 The high 5-day BOD and coliform count indicated at this point are reflections of untreated sanitary and industrial waste flows discharged upstream.
- SL 24.93 The excessive pollution indicated at this point results from the tremendous volume of inadequately treated industrial wastes as well as sanitary sewage from the City of Cornwall.
- SL 28.6 No definite explanation is provided for the high coliform count recorded on July 7, 1964 at the Robert Saunders Generating Station.
- SL 35.2 The high coliform count reported at this point was not confirmed in subsequent sampling results.
- SL 41.9 The high coliform count reported at this point was not substantiated in later sampling results.
- SL 43.15 The high coliform count indicated at this point was not confirmed by subsequent sampling results.
- SL 45.5 The high coliform count recorded at this point was not confirmed by subsequent sampling results.
- SL 59.95 The high coliform count recorded for the sampling point below the Iroquois sewage treatment plant outfall was not confirmed by subsequent sampling results.

- SL 61.1 The high coliform count recorded at this point was not confirmed by subsequent sampling results.
- SL 62.2 The high coliform count recorded at this point was not substantiated by subsequent sampling results.
- SL 62.6 The high coliform count recorded at this point was not confirmed by subsequent sampling results.
- SL 63.35 The high coliform count recorded at this point might be attributed to inadequately treated sanitary wastes from the Village of Cardinal.
- SL 65.1 The intermittent pattern of high coliform counts at this point is attributable to inadequate treatment of industrial and sanitary waste flows from the Village of Cardinal.
- SL 65.5A The intermittent pattern of high coliform counts at this point is indicative of inadequately treated industrial and sanitary waste flows from the Village of Cardinal.
- SL 65.5B The high coliform counts reported at this point indicate inadequate treatment of sanitary waste flows from the Village of Cardinal.
- SL 65.85 The high coliform count reported at this point could be attributable to inadequately treated sanitary sewage flows from the Village of Cardinal.
- SL 67.85 The high coliform count recorded at this point was not confirmed by subsequent sampling results.
- SL 75.0 The high 5-day BOD and excessive coliform count recorded at this point reflect the lack of treatment provided for sanitary and industrial waste flows in the Town of Prescott.
- SL 77.0 The high coliform counts recorded at this point reflect the lack of treatment afforded sanitary waste flows from the Town of Prescott.
- SL 86.1 The high coliform count recorded at this point was not confirmed by subsequent sampling results.
- SL 87.3 The intermittent high counts recorded downstream of Brockville reflect the need for sewage treatment which has been provided subsequent to this survey.

- SL 88.8 The high coliform count recorded at this point was not confirmed in subsequent sampling results.
- SL 107.0 The high coliform count recorded at this point was not confirmed in subsequent sampling results.
- SL 108.6 The high coliform count recorded at this point was not confirmed in subsequent sampling results.
- SL 109.4 The high coliform count recorded at this point was not confirmed in subsequent sampling results.
- SL 120.9 The high coliform counts recorded at this point indicate inadequately treated sanitary wastes discharging to the river from the Town of Gananoque.
- SL 121.1 The high coliform counts recorded at this point indicate inadequately treated sanitary wastes discharging to the river from the Town of Gananoque.
- SL 121.5 The trend of general reduction in coliform content might be attributed to the implementation of a sewage works system during the period of this survey.
- SL 121.6 The high coliform count recorded at this point could reflect inadequately treated industrial waste discharged from the milk processing plant located in this vicinity.
- SL 136.3 The pattern of high coliform counts recorded at this point might be attributed to the lack of effluent chlorination at the Kingston sewage treatment plant during the period of this survey.
- SL 144.1 The appreciable 5-day BOD recorded at this point might be attributed to inadequately treated industrial waste discharges to the Little Cataraqui Creek.
- CC 1.2

NUTRITIONAL AND RELATED PROBLEMS

Overfertilization and Biological Productivity

The nutrients which contribute to biological productivity in surface waters originate from domestic and industrial waste as well as from farmland. The most striking evidence of over-enrichment is prolific algae growth, which can clog water

intakes and filters, pile up on beaches, create unsightly conditions and upon death and decay cause unpleasant odours. Research has shown that nitrogen and phosphorous are both essential for the growth of algae and that limitations in amounts of these elements is usually the factor that control their rate of growth.

Laboratory Results

The nitrogen and phosphorous data as included in Table II are part of a survey being undertaken to determine the relative amounts of fertilizing elements that are contributed by municipalities, industries, and land drainage, to the St. Lawrence River. The nitrogen is reported in terms of Free Ammonia, Total Kjeldahl, Nitrite Nitrogen, Nitrate Nitrogen, and the Phosphorus in terms of total and soluble forms. The significance of the various forms of nitrogen and phosphorus are outlined in the appendix.

Due to the limited nature of the data obtained to date as an excerpt from a continuing survey, this information is included for reference purposes only.

CHEMICAL ANALYSES AND PHYSICAL DETERMINATIONS

With respect to the Chemical Analyses and Physical Determinations reference should be made to Table III and the appended significance of Laboratory Analyses.

Hardness

With reference to the samples collected at the Kingston water works during 1962-3-4 it may be seen that although the St. Lawrence River water is moderately hard there is a slight

increase in hardness each year.

The same condition prevails at Maitland and Cornwall with a slight increase in hardness each year.

Alkalinity

It may be noted that an accompanying slight increase in alkalinity has occurred over the three year period.

Iron

It is noted that fluctuations in iron content occurred at Kingston with a slight increase at Maitland and Cornwall over the three year period. However, OWRC objectives were not exceeded.

Chlorides

It may be noted that although fluctuations occurred at Kingston, Maitland and Cornwall in the chloride content of St. Lawrence River water it was well within the OWRC objective of 250 ppm.

pH

The waters of the St. Lawrence River at Kingston, Maitland and Cornwall for the period of this survey generally met the objectives set by the OWRC for pH values.

Colour and Turbidity

The colour and turbidity of the St. Lawrence River water at Kingston, Maitland and Cornwall in general did not exceed the OWRC objectives.

SUMMARY

This report deals with water sampling surveys performed on the St. Lawrence River from the Quebec boundary to the City of Kingston during the period of 1962-3-4. In addition, reference is made to a more comprehensive water quality monitoring of the tributaries and specific areas of the river initiated in 1964.

The surface water quality objectives of the Commission were not met at many points on the St. Lawrence River. Although fluctuating in nature, the laboratory analyses results reveal localized areas of pollution in the vicinity of several municipalities. The adverse influence of sanitary and industrial wastes emanating from these municipalities is reflected in these sampling results. Although sewage treatment is provided by the majority of the municipalities, the effectiveness of the treatment is somewhat minimized in some cases by the presence of domestic sewage or industrial wastes in the storm sewer systems and/or drainage courses. In some instances, industrial wastes are discharged directly to the receiving waters partially treated or untreated. The extent of pollution from the numerous commercial and pleasure craft using these waters is not immediately known due to difficulties in tracing pollution sources of this nature.

In order to maintain the sanitary chemical and

bacteriological qualities of the water of the St. Lawrence River to acceptable limits, and to maintain a satisfactory standard of water quality therein,adequate treatment of all sanitary and industrial wastes discharged to the lake and its tributaries should be provided.

This three year study revealed results in excess of the OWRC objectives for water quality in the vicinity of the following centres of population.

City of Cornwall
Village of Cardinal
Town of Prescott
City of Brockville
Town of Gananoque
City of Kingston

The OWRC objectives were also exceeded in the vicinity of Charlottenburgh Provincial Park and at the mouth of the Little Cataraqui Creek.

The study of nutritional and related problems in the St. Lawrence River through the comprehensive water quality monitoring program commenced in 1964 and its resultant data compiled to date is considered insufficient in nature for conclusion at this time and therefore is included for reference purposes only.

The chemical analyses and physical determinations of samples collected at Kingston, Maitland and Cornwall water works revealed a slight increase in hardness and alkalinity with an acceptable chloride content. The iron content although

fluctuating at Kingston, showed a slight increase at Maitland and Cornwall but not in excess of OWRC objectives. pH, colour and turbidity limits in general were not exceeded over this period at the three locations on the river.

RECOMMENDATIONS

Officials of the City of Cornwall should continue with their efforts in providing waste treatment facilities.

The responsible parties should proceed without further delay in providing adequate treatment for the tremendous volumes of paper mill and textile industry wastes at present discharging to the St. Lawrence River at the City of Cornwall.

Officials of the Village of Cardinal and the local starch company should proceed without delay to provide adequate waste treatment preferably on a combined basis.

Adequate waste treatment is necessary at the Town of Prescott in order to provide protection for water quality in this area.

Officials of the City of Brockville should ensure that all contaminated wastes are directed to the recently constructed sewage treatment plant.

Sanitary and industrial waste flows presently discharging to the St. Lawrence River from the Town of Gananoque either should be adequately treated prior to their discharge or directed to the municipal sewage lagoon.

The responsible parties should ensure that adequate treatment is provided for all sanitary and industrial waste flows originating in the vicinity of the City of Kingston.

All of which is respectfully submitted,

District Engineer: *L. South*
for J. K. Theil

Approved by: *J. R. Barr*
J. R. Barr, Director,
Division of Sanitary Engineering.

Prepared by: A. D. McConnell

/mh

SIGNIFICANCE OF LABORATORY ANALYSES

TABLE I ANALYSES

Bacteriological Examination

The membrane filter technique is employed to obtain a direct enumeration of coliform organisms and is reported per 100 millilitres. The presence of coliforms indicates pollution from human or animal excrement, or from some non-faecal forms. A membrane filter coliform count in excess of the desirable upper limit of 2,400 organisms is considered to render waters undesirable for bathing purposes.

The M.P.N. Index reported by Regional Health Laboratories on drinking water supplies as the "Most Probable Number" (M.P.N.) per 100 millilitres of sample is employed to determine the count of coliform bacteria present in water supplies.

Chemical Analysis

Biochemical Oxygen Demand (BOD)

Biochemical oxygen demand is reported in parts per million (ppm), and is an indication of the amount of oxygen required for the stabilization of decomposable organic matter in the water. The completion of the laboratory test requires five days, under the controlled incubation temperature of 20°Centigrade.

The OWRC objective for surface water quality is an upper limit of four (4) ppm.

Solids

The value for total solids, expressed in parts per million (ppm), is the sum of the values for the suspended and the dissolved matter in the water. The concentration of suspended solids is generally the most significant of the solids analyses in regards to surface water quality.

The effects of suspended solids in water are reflected in difficulties associated with water purification, depositions in streams and injury to the habitat of fish. Where suspended solids values are less than 20 ppm, laboratory difficulties are experienced and the turbidity is determined instead.

Turbidity

Turbidity is caused by the presence of suspended matter, such as clay, silt, finely divided organic matter, plankton and other microscopic organisms in water. It is an expression of the optical property of a sample and results are reported in "turbidity units".

Physical Determinations

Dissolved Oxygen

The amount of dissolved oxygen contained in unpolluted water fluctuates with the temperature. A deficiency of oxygen is replaced by solution of oxygen from the atmosphere. There is a saturation value for each temperature. At 18°C this is 9.54 ppm of dissolved oxygen. Values below the saturation level indicate

the presence of polluting organic substances which are absorbing oxygen from the water. The extent of this deficiency is one index of the degree of organic pollution. Substantial reduction in dissolved oxygen causes suffocation of fish.

Temperature

The temperature of water influences the solubility of oxygen and the rate of oxidation and purification.

TABLE II ANALYSES

Nitrogen

Ammonia Nitrogen or sometimes called free ammonia is the insoluble product in the decomposition of nitrogenous organic matter. It is also formed when nitrates and nitrites are reduced to ammonia either biologically or chemically; Some small amounts of ammonia, too, may be swept out of the atmosphere by rain water.

The following values may be of general significance in appraising free ammonia content: Low 0.015 to 0.03 ppm; moderate 0.03 to 0.10 ppm; high 0.10 or greater.

Total Kjeldahl is a measure of the total nitrogenous matter present except that measured as nitrite and nitrate nitrogens. The Total Kjeldahl less the Ammonia Nitrogen measures the organic nitrogen present. Ammonia and organic nitrogen determinations are important in determining the availability of nitrogen for biological utilization. The normal range for Total Kjeldahl would be 0.1 to 0.5 ppm.

Nitrite Nitrogen

Nitrite is usually an intermediate oxidation product of ammonia. The significance of nitrites, therefore, varies with their amount, sources, and relation to other constituents of the sample, notably the relative magnitude of ammonia and nitrate present. Since nitrite is rapidly and easily converted to nitrate, its presence in concentrations greater than a few thousandths of a part per million is generally indicative of active biological processes in the water.

Nitrate Nitrogen

Nitrate is the end product of aerobic decomposition of nitrogenous matter, and its presence carries this significance. Nitrate concentration is of particular interest in relation to the other forms of nitrogen that may be present in the sample. Nitrates occur in the crust of the earth in many places and are a source of its fertility.

The following ranges in concentration may be used as a guide. Low less than 0.1 ppm; moderate 0.1 to 1.0 ppm; high greater than 1.0 ppm.

Phosphorus

Total Phosphorus is a measure of both the organic and inorganic forms of phosphorus present.

Soluble Phosphorus is a measure of the orthophosphate only and when subtracted from the total phosphorus gives an

indication of the concentration of organic phosphorus present. That is, the soluble phosphorus is a measure of the inorganic phosphorus present except the phosphorus in the form of poly phosphate, which, however in surface waters is usually insignificant. Inorganic phosphorus in concentration in excess of 0.01 ppm may cause nuisance conditions.

TABLE III ANALYSES

Chemical Analyses

Hardness

The hardness of water reflects the nature of the geological formations with which it has been in contact. Hard waters are as satisfactory for human consumption as soft waters. Waters with a hardness of 75-100 ppm are considered moderately hard and waters with a hardness of 150-300 ppm are classified as hard.

Alkalinity

The alkalinity of natural waters is caused by three major classes of materials which may be ranked in order of their effect on pH as follows (1) hydroxides (2) carbonates and (3) bicarbonates and other salts of weak acids. The alkalinity of a water has little sanitary significance but is of importance in water, sewage and industrial waste treatment practices.

Iron

The OWRC 1964 Drinking Water Objectives set a limit of 0.3 ppm for iron. This limitation is based on consideration of

appearance rather than health.

Chlorides

Chlorides in reasonable concentrations are not harmful to humans. At concentrations above 250 ppm they give a salty taste to the water which is objectionable to many people. For this reason, the OWRC 1964 Drinking Water Objectives recommends that chlorides be limited to 250 ppm in supplies intended for public use.

pH

The pH value, for practical purposes, refers to acidity or alkalinity, and is a measure of intensity rather than quantity. The pH scale extends from zero (very acidic) to 14 (very alkaline), with the middle value of 7 corresponding to neutrality at 25° Centigrade. The pH of surface water should be in the range of 6.7 to 8.5.

Physical Determination

Colour and Turbidity

Although these tests do not directly measure the safety of the water, they are related to consumer acceptance of the water. At levels in excess of 15 units of colour and 5 units of turbidity in the raw water consumer acceptance may be conditional upon treatment of the water.

TABLE I

Sample Point No.	Description	Date	M.F. Coliforms per 100 ml.	5-Day BOD ppm	SOLIDS (ppm)			Turbidity Units	°C
					Total	Susp.	Diss.		
SL 0.0	Qubec-Ontario Boundary - Chez Paul	July 17/62	14						
		Aug. 29/62	400						
		July 3/63	800						
		Aug. 20/63	90						
		July 7/64	28						
SL 6.6	Glengarry Park - Swimming Area	July 17/62	8						
		Aug. 29/62	12						
		July 3/63	98						
		July 7/64	22						
SL 9.1	Lancaster - East End	July 17/62	19						
		Aug. 29/62	64						
		Aug. 20/63	300						
SL 9.8	Lancaster - Pier	July 17/62	9						
		Aug. 29/62	20						
		July 3/63	20						
		Aug. 20/63	200						
		July 7/64	6						
SL 9.9R 0.8	Raisin River at Hwy. #2	Oct. 17/62	76	1.8	368			3.6	
		July 25/63	46	1.3	252			2.3	
		1964							
			92	1.2	282	6.8	277		9.0
SL 13.0	Charlottenburgh Park - Bathing Area	July 17/62	21,700						
		Aug. 29/62	26,000						
		July 3/63	170						
		Aug. 20/63	6,000						
		July 7/64	28						

TABLE I - i (cont'd)

Sample Point No.	Description	Date	M.F. Coliforms per 100 ml.	5-day BOD ppm	SOLIDS (ppm)			Turbidity Units	D.O.	°C Temp.
					Total	Susp.	Diss.			
SL 15.7	Summerstown - Dock	July 17/62	57							
		Aug. 29/62	69							
		July 3/63	132							
		Aug. 20/63	3							
		July 7/64	80							
SL 18.0	Parco Village - Dock	July 17/62	3							
		Aug. 29/62	73							
		July 3/63	178							
		Aug. 20/63	54							
		July 7/64	24							
SL 19.8	Glen Walter - Dock	July 17/62	370							
		Aug. 29/62	104							
		July 3/63	3,400							
		Aug. 20/63	79							
		July 7/64	1,100							
SL 21.7	Glengarry - Stormont border	July 18/62	27,000							
		Aug. 29/62	690							
		July 3/63	3,200							
		Aug. 20/63	900							
		Nov. 20/63	17,100	2.8	218	3	215			
		July 7/64	2,800							
SL 22.0	Cornwall- opposite east end Texaco station	July 18/62	8,500							
		Aug. 29/62	1,100							
		July 3/63	180,000							
		Aug. 20/63	5,800							
		July 7/64	540							
SL 22.80	Cornwall - opposite Danis Ave.	Nov. 20/63	214,000	4.4	222	5	217			

TABLE I - ii (cont'd)

Sample Point No.	Description	Date	M.F. Coliforms per 100 ml.	5-Day BOD ppm	SOLIDS (ppm)			Turbidity Units	°C	
					Total	Susp.	Diss.		D.O.	Temp.
SL 22.90	Cornwall - opposite Courtaulds Office	Nov. 20/63	93,000	9.6	261	5	256			
SL 22.91	Cornwall - opposite Courtaulds' West Sewer outfall	Nov. 20/63	8,900	6.0	276	6	270			
SL 22.92	St. Lawrence Park - Bathing Area - Cornwall	July 18/62	5,000							
		Aug. 29/62	8,000							
		July 3/63	60,000							
		Nov. 3/63	11,900	4.4	276	2	274			
		July 7/64	820							
		Sept. 30/64	14,800	1.7	242			2.8	8.6	15
		Nov. 30/64	440	1.8		3		1.5	12.3	6
SL 23.02	New Seaway Pier - Cornwall	July 18/62	7,700							
		Aug. 29/62	42,000							
		July 3/63	1,590,000							
		Aug. 20/63	15,000							
		July 7/64	23,000							
SL 23.1C	Old Cornwall Canal - east end	July 18/62	97							
		Aug. 29/62	130							
		July 3/63	190,000							
		Aug. 20/63	900							
		July 7/64	150							
SL 24.5C	Old Cornwall Canal at Augusta Street bridge	July 18/62	29							
		Aug. 29/62	180							
		July 3/63	292							
		Aug. 20/63	20							

TABLE I - iii (cont'd)

Sample Point No.	Description	Date	M.F. Coliforms per 100 ml.	5-Day BOD ppm	SOLIDS (ppm)			Turbidity Units	D.O.	°C Temp.
					Total	Susp.	Diss.			
SL 27.8C	Old Cornwall Canal Saunders dam	July 18/62	20							
		Aug. 29/62	30							
		July 3/63	38							
		Aug. 20/63	300							
		July 7/64	20							
SL 24.91	International Bridge	Nov. 20/63	10,300	9.8	284	82	202			
SL 24.93	100' downstream from Fly Creek outfall	Dec. 9/63	185,000,000	400	2218	437	1781			
SL 28.5	300 ft. downstream from Saunders dam	July 18/62	45							
		Aug. 29/62	90							
		July 3/63	60							
		Aug. 20/63	60							
		July 7/64	26							
SL 28.6	Saunders dam at spillway - 100 ft. from east end	July 18/62	80							
		Aug. 29/62	22							
		July 3/63	490							
		Aug. 20/63	53							
		July 7/64	51,000							
SL 28.95	Lake St. Lawrence at old canal diversion	July 18/62	17							
		Aug. 29/62	67							
		July 3/63	162							
		Aug. 20/63	42							
		July 7/64	8							
SL 34.0	Long Sault - Stormont Yacht Club dock	July 18/62	500							
		Aug. 29/62	70							
		July 3/62	18							
		Aug. 21/63	8							
		July 7/64	2							

TABLE I - iv (cont'd)

Sample Point No.	Description	Date	M.F. Coliforms per 100 ml.	5-Day BOD ppm	SOLIDS (ppm)			Turbidity Units	D.O.	Temp.
					Total	Susp.	Diss.			
SL 34.65	Long Sault - Beach	July 18/62	300							
		Aug. 29/62	220							
		July 3/63	18							
		Aug. 21/63	4							
		July 7/64	0							
SL 34.85	Long Sault Parkway - East Bridge	July 18/62	200							
		Aug. 29/62	<10							
		July 3/63	98							
		Aug. 21/63	18							
		July 7/64	0							
SL 35.2	Long Sault Parkway - Mille Roche Park - Bathing Area	July 18/62	26							
		Aug. 29/62	4,000							
		July 3/63	4,500							
		Aug. 21/63	120							
		July 7/64	30							
SL 38.0	Long Sault Parkway - Woodlands Park - Bathing Area	July 18/62	900							
		Aug. 29/62	110							
		July 3/63	78							
		Aug. 21/63	10							
		July 7/64	90							
SL 39.55	Long Sault Parkway - West Bridge	July 18/62	300							
		Aug. 29/62	20							
		July 3/63	160							
		Aug. 21/63	700							
		July 7/64	20							
SL 41.9	Farran Park - Bathing Area	July 18/62	13,900							
		Aug. 29/62	30							
		July 3/63	198							
		Aug. 21/63	36							
		July 7/64	60							

TABLE I - v (cont'd)

Sample Point No.	Description	Date	M.F. Coliforms per 100 ml.	5-Day BOD ppm	SOLIDS (ppm)			Turbidity Units	D.O.	°C Temp.
					Total	Susp.	Diss.			
SL 43.15	Nairn Island - bathing area	July 18/62		90						
		Aug. 29/62		4,800						
		July 2/63		170						
		Aug. 21/63		28						
		July 7/64		290						
SL 45.5	Ault Island - S.W. corner	July 18/62		7,900						
		Aug. 29/62		800						
		July 2/63		400						
		Aug. 21/63		210						
		July 7/64		90						
SL 46.6	Crysler Park - bathing area	July 19/62		110						
		Aug. 29/62		1,600						
		July 2/63		270						
		Aug. 21/63		350						
		July 7/64		330						
SL 49.4	Riverside Park - bathing area	July 19/62		270						
		Aug. 29/62		900						
		July 2/63		400						
		Aug. 21/63		90						
		July 7/64		30						
SL 52.1	Morrisburg beach - downstream of golf club	July 19/62		310						
		Aug. 29/62		900						
		Aug. 21/63		200						
		July 7/64		580						
SL 52.7	Morrisburg beach - bathing area	July 19/62		710						
		Aug. 29/62		800						
		July 2/63		300						
		Aug. 21/63		600						
		July 7/64		300						

TABLE I - vi (cont'd)

Sample Point No.	Description	Date	M.F. Coliforms per 100 ml.	5-Day BOD ppm	SOLIDS (ppm)			Turbidity Units	D.O.	°C Temp.
					Total	Susp.	Diss.			
SL 53.05	Morrisburg beach - pier	July 19/62		250						
		Aug. 29/62		1,300						
		July 2/63		2,200						
		Aug. 21/63		500						
		July 7/64		158						
SL 53.35	Morrisburg - upstream of pump- ing station	July 19/62		300						
		Aug. 29/62		1,500						
		July 2/63		800						
		Aug. 21/63		136						
		July 7/64		2,500						
SL 59.95	Downstream of Iro- quois Sewage Treat- ment Plant outfall	July 19/62		350						
		Aug. 29/62		>150						
		July 2/73		2,700						
		Aug. 21/63		253						
		July 7/64		710						
SL 60.55	Iroquois - beach	July 19/62		320						
		Aug. 29/62		160						
		July 2/63		82						
		Aug. 21/63		270						
		July 7/64		1,400						
SL 60.8	Old Iroquois Canal	July 19/62		94						
		Aug. 29/62		13						
		July 2/63		52						
		Aug. 21/63		116						
		July 7/64		210						
SL 61.0	Iroquois lock approach - east end	July 19/62		530						
		Aug. 29/62		37						
		July 2/63		700						

TABLE I - vii (cont'd)

Sample Point No.	Description	Date	M.F. Coliforms per 100 ml.	5-Day BOD ppm	SOLIDS (ppm)			Turbidity Units	D.O.	°C Temp.
					Total	Susp.	Diss.			
SL 61.1	Seaway Canal - Iroquois lock 7 - east end	July 19/62	3,300							
		Aug. 29/62	80							
		July 2/63	1,900							
		Aug. 22/63	210							
		July 7/64	112							
SL 61.15	Iroquois control dam - north end	July 19/62	430							
		Aug. 29/62	22							
		July 2/63	1,800							
		Aug. 22/63	2,200							
		July 7/64	700							
SL 62.2	Seaway Canal - Iroquois lock 7 - west end	July 19/62	12,000							
		Aug. 29/62	3,100							
		July 2/63	2,300							
SL 62.6	Iroquois lock approach - west end	July 19/62	14,000							
		Aug. 29/62	0							
		July 2/63	1,500							
		July 7/64	700							
SL 63.35	Galop Canal 2½ miles downstream of Cardinal	Sept.30/64	6,100							
SL 65.1	0.7 miles west of county line - below Cardinal Main Septic Tank outfall	July 19/62	6,300							
		Aug. 29/62	>15,000							
		July 2/63	2,400							
		Aug. 22/63	194							
		July 8/64	7,300							

TABLE I - viii (cont'd)

Sample Point No.	Description	Date	M.F. Coliforms per 100 ml.	5-Day BOD ppm	SOLIDS (ppm)			Turbidity Units	D.O.	°C Temp.
					Total	Susp.	Diss.			
SL 65.5A	River at cut between Galop Canal & river below Cardinal	July 19/62	3,200							
		Aug. 29/62	>150							
		July 2/63	3,000							
		July 7/64	8,000							
SL 65.5B	Canal - at cut between Galop Canal & river below Cardinal	July 19/62	4,400							
		Aug. 29/62	>15,000	0.7	206			1.5		
		July 2/63	470							
		July 7/64	540							
SL 65.85	Galop Canal - 400 ft. east of north septic tank outfall	July 19/62	600							
		Aug. 29/62	2,000							
		July 2/63	1,000							
		Aug. 22/63	2,800							
		July 8/64	152							
SL 66.8	River - 600 ft. south east of Legion Hall	July 19/62	71							
		Aug. 29/62	1,600							
		Aug. 22/63	134							
SL 67.05A	West inlet to Galop Canal - Cardinal	July 19/62	9							
		Aug. 29/62	6							
		Aug. 22/63	1,100							
		July 8/64	14							
SL 67.05B	Old Canal - north of Legion Hall - Cardinal	July 19/62	12							
		Aug. 29/62	39	0.7	212			0.8		
		July 8/64	20							
SL 67.85	Old Canal - abandoned locks - ½ mile west of Cardinal	July 19/62	124,000							
		Aug. 29/62	31							
		July 2/63	54							
		Aug. 22/63	4							
		July 8/64	16							

TABLE I - ix (cont'd)

Sample Point No.	Description	Date	M.F. Coliforms per 100 ml.	5-Day BOD ppm	SOLIDS (ppm)			Turbi- dity		°C
					Total	Susp.	Diss.	Units	D.O.	
SL 70.95	End of road to north	July 19/62	30							
	channel - centre	Aug. 29/62	19							
	length of channel	July 2/63	56							
		Aug. 22/63	400							
		July 8/64	26							
SL 71.9	Grenville Park -	July 19/62	1,700							
	bathing area	Aug. 29/62	62							
		July 2/63	140							
		Aug. 22/63	12							
		July 8/64	32							
SL 73.5	Johnstown - opposite McAulley's Motel	Aug. 38/64	900	1.3	238	19	219	3.8	8.2	20
		Sept. 29/64	38	1.4	220	--	--		9.2	13
SL 75.0	Windmill Point	July 19/62	6,000							
		Aug. 29/62	270	1.6	218					
		July 2/63	8,000	1.3	248			5.0		
		Aug. 22/63	58							
		July 8/64	160	2.5	244	55	189			
SL 75.8	200 ft. east of west railway via- duct east of Prescott	July 19/62	1,100							
		Aug. 29/62	340							
		July 2/63	380							
		Aug. 22/63	114							
SL 76.0	Prescott - opposite Boundary Street	Nov. 2/64	3,800,000	11.0	232	34	198			
SL 76.7	Prescott - foot of Centre Street	July 19/62	1,400							
		Aug. 29/62	1,900							
		July 2/63	72							
		Aug. 22/63	220							
		July 8/64	280							

TABLE I - x (cont'd)

Sample Point No.	Description	Date	M.F. Coliforms per 100 ml.	5-Day BOD ppm	SOLIDS (ppm)			Turbidity Units	D.O.	°C Temp.
					Total	Susp.	Diss.			
SL 77.0	Prescott - foot of West Street	July 19/62	9,300							
		Aug. 29/62	500							
		July 2/63	4,800							
		Aug. 22/63	232							
		July 8/64	410							
SL 78.2	West of creek out- let - 1 mile west of Prescott	July 18/62	34							
		Aug. 29/62	800							
		July 2/62	62							
		Aug. 22/63	12							
		July 8/64	110							
SL 80.0	Maitland works Recreation Park	July 18/62	120							
		Aug. 29/62	6	1.0	220			2.3		
		July 2/63	28	1.0	244			2.9		
		Aug. 22/63	90	1.6	224			3.5		
		July 8/64	50	3.7	216	24	192			
SL 82.4	Maitland - end of Brock Chemical Road	July 18/62	50							
		Aug. 29/62	1,200							
		July 2/63	174							
		Aug. 22/63	170							
		July 8/64	110							
SL 83.3	½ mile east of center of Maitland	July 18/62	166							
		Aug. 29/62	600							
		July 2/63	90							
		Aug. 22/63	330							
		July 8/64	130							
SL 84.0	Center of Maitland	July 18/62	570							
		Aug. 29/62	1,700							
		July 2/63	102							
		Aug. 22/63	78							
		July 8/64	8							

TABLE I - xi (cont'd)

Sample Point No.	Description	Date	M.F. Coliforms per 100 ml.	5-Day BOD ppm	SOLIDS (ppm)			Turbidity Units	D.O.	°C Temp.
					Total	Susp.	Diss.			
SL 84.4	$\frac{1}{2}$ mile west of center of Maitland	July 18/62	70							
		Aug. 29/62	210							
		July 2/63	40							
		Aug. 22/63	174							
		July 8/64	28							
SL 86.1	Opposite Fulford Residence near Leeds- Grenville boundary	July 18/62	19							
		Aug. 29/62	124	2.0	222			2.6		
		July 2/63	25,300	1.3	228			1.5		
		Aug. 22/63	179	1.3	214			1.1		
		July 8/64	146	0.8	222	8	214			
SL 87.3	Brockville East Limit - Davis Motel Dock	July 18/62	3,400							
		Aug. 29/62	3,400							
		July 2/63	98							
		July 8/64	4,900							
		Aug. 12/64	230	1.0	240	10	230	7.0		20
		Sept. 29/64	6,500	1.4	240			10.4		14
		Dec. 1/64	>10	1.5		2		1.5 13.7		5½
SL 87.80	Brockville - foot of Oxford Street	July 18/62	0							
		Aug. 29/62	1,600							
		July 8/64	118							
SL 88.8	Brockville - Block- house Island	July 18/62	25							
		Aug. 29/62	>15,000							
		July 4/63	3							
		July 8/64	170							
SL 90.0	Brockville - St. Lawrence Park	July 18/62	81							
		Aug. 29/62	170	2.6	224			4.0		
		July 4/63	22	2.2	218			0.3		
		July 8/64	180	1.3	230	8	222			

TABLE I - xii (cont'd)

Sample Point No.	Description	Date	M.F. Coliforms per 100 ml.	5-Day BOD ppm	SOLIDS (ppm)			Turbidity Units	D.O.	°C Temp.
					Total	Susp.	Diss.			
SL 91.2	McDonald's Point	July 18/62	3							
		Aug. 29/62	30							
		July 4/63	22							
		July 9/64	42							
SL 93.4	Fulford Point (behind DHO Yard)	July 18/62	8							
		Aug. 29/62	<10							
		July 4/63	0							
		July 9/64	54							
SL 95.8	Butternut Bay - dock	July 18/62	41							
		Aug. 29/62	370							
		July 4/63	6							
		July 9/64	170							
SL 99.1	Brown's Bay	July 18/62	12							
		Aug. 29/62	43	4.8	216			1.8		
		July 4/63	150	0.8	204			1.0		
		July 9/64	60	2.1	212	13	199			
SL 102.2	Mallory town landing	July 18/62	80							
		Aug. 29/62	100							
		July 4/63	25							
		July 9/64	24							
SL 107.0	End of Narrow's Lane Road	July 18/62	13							
		Aug. 29/62	74							
		July 4/63	4,200							
		July 9/64	400							

TABLE I - xiii (cont'd)

Sample Point No.	Description	Date	M.F. Coliforms per 100 ml.	5-Day BOD ppm	SOLIDS (ppm)			Turbidity Units	D.O.	°C Temp.
					Total	Susp.	Diss.			
SL 108.5	Rockport - East Limit at Evinrude Marina	July 18/62	0							
		Aug. 29/62	1,300							
		July 4/63	86							
		July 9/64	110							
SL 108.6	Rockport - Canada Customs Dock	July 18/62	21							
		Aug. 29/62	>15,000							
		July 4/63	23							
		July 9/64	34							
SL 109.4	Redstone Island - 1 mile west of Rockport	July 18/62	58							
		Aug. 29/62	6,000							
		July 4/63	18							
		July 9/64	520							
SL 111.3	Ivy Lea Park	July 18/62	16							
		Aug. 29/62	24							
		July 4/63	66							
		July 9/64	210							
SL 116.7	Holsted Bay - D.H.O. Park	July 18/62	0							
		Aug. 29/62	120							
		July 4/63	30							
		July 9/64	12							
SL 119.4	D.H.O. Park - 1 mile east of Gananoque	July 17/62	29							
		Aug. 29/62	70							
		July 4/63	1,400							
		July 9/64	470							

TABLE I - xiv (cont'd)

Sample Point No.	Description	Date	M.F. Coliforms per 100 ml.	5-Day BOD ppm	SOLIDS (ppm)			Turbidity Units	D.O.	Temp.
					Total	Susp.	Diss.			
SL 120.9	Gananoque - foot of William Street	July 17/62	490							
		Aug. 29/62	4,000							
		July 4/63	8,000							
		July 9/64	16,000							
SL 121.1	Gananoque - Canoe Club	July 17/62	23,000							
		Aug. 29/62	158	1.4	192			1.4		
		July 4/63	4,400	1.1	194			0.7		
		July 9/64	3,900	1.2	210	6	204			
SL 121.3G	Gananoque River at St. Lawrence River	Aug. 12/64	130	1.1	184	4	180		13.6	21½
		Sept. 16/64	1,100	1.2	156	--	---	2.8		
		Sept. 30/64	152	1.2	170			2.6	9.4	14
		Nov. 3/64	330	2.2	176	9		1.7	15.6	1
SL 121.5	Gananoque - at customs dock	July 17/62	7,300							
		Aug. 29/62	26,000							
		July 4/63	2,100							
		July 9/64	138							
SL 121.6	Gananoque - at Cow & Gate plant	July 17/62	490							
		Aug. 29/62	430							
		July 4/63	900							
		July 9/64	2,900							
SL 121.8	Gananoque - Rotary Beach - Victoria Street	July 17/62	109							
		Aug. 29/62	240							
		July 4/63	78							
		July 9/64	108							

TABLE I - xv (cont'd)

Sample Point No.	Description	Date	M.F. Coliforms per 100 ml.	5-Day BOD ppm	SOLIDS (ppm)			Turbidity Units	D.O.	°C Temp.
					Total	Susp.	Diss.			
SL 122.1	Gananoque Park - Osborne Street	July 17/62	4							
		Aug. 29/62	0							
		July 4/63	1,900							
		July 9/64	234							
SL 123.3	Howe Island - east ferry landing	July 17/62	53							
		Aug. 29/62	600	0.5	194			1.1		
		July 4/63	12	1.2	196			0.7		
		July 9/64	224	1.1	216	6	210			
SL 131.6	Howe Island - west ferry landing	July /64	0							
		Aug. /64	2							
SL 134.2	Treasure Island	July /64	10							
		Oct. /64	850	1.4	200					
SL 136.1	Glen Lawrence Manor	Aug. 30/62	1,300							
		July /64	1,900							
SL 136.3	Glen Lawrence Water Works at shore	Aug. 30/62	128							
		July /63	124							
		June /64	9,600							
		June /64	9,700							
		July /64	11,000							
		Oct. /64	71,000							
SL 136.7	McKnight Property	Aug. /62	12							
		July /63	37							
		July /64	41							

TABLE I - xvi (cont'd)

Sample Point No.	Description	Date	M.F. Coliforms per 100 ml.	5-Day BOD ppm	SOLIDS (ppm)			Turbidity		°C
					Total	Susp.	Diss.	Units	D.O.	
SL 137.2	Kingston Sewage Treatment Plant dock - upstream of outfall	Aug. /62	14							
		July /63	50							
		June /64	78							
		July /64	37							
		Oct. /64	70	2.0	218	20				
SL 138.5	Cartwright Point	Aug. /62	800							
		July /64	8							
SL 138.8	Army Bathing Beach	July /64	370							
SL 139.0	Wolfe Island - Cone Point	July /64	0	0.7	228	6				
SL 139.4	Point Frederick	Aug. /62	50							
		July /63	96	1.4	214			1.8		
		July /63	14							
SL 140C 0.5	Cataraqui River at Hwy. #2	Aug. 22/62	1,070	2.3	184			1.7		
		Aug. 6/63		1.4						
		Aug. 11/64	30	1.5	238	15	223			
		Sept. 29/64	94	1.1	204			6.0	9.5	16
		Nov. 30/64	430	2.1	228			4.5	13.2	3
SL 141.2	Opposite City Hall - Kingston	Aug. /62	6							
		July /63	1,900							
		July /64	0							
SL 141.8	McDonald Park - Kingston	Aug. /62	1,700							
		July /64	16							

TABLE I - xvii (cont'd)

Sample Point No.	Description	Date	M.F. Coliforms per 100 ml.	5-Day BOD ppm	SOLIDS (ppm)			Turbi- dity Units	D.O.	°C Temp.
					Total	Susp.	Diss.			
SL 143.5	Lake Ontario Park - Kingston	Aug. /62	2							
		July /63	26							
		July /64	18							
SL 144.1 CC 0.0	Cataraqui Creek at Lake Ontario	Aug. 21/62	50							
		July 3/63	10							
		Sept. 10/63	0							
		July 21/64		3.2	264	13	251			
SL 144.1 CC 1.2	Cataraqui Creek at Hwy. #33	Aug. 11/62	80	5.3	336	12	324		14.1	23
		Sept. 29/64	12	4.5	366			4.0	12.1	16
		Nov. 30/64	250	2.4	414			8.0	13.4	1
SL 144.6	Dupont Water Works intake - raw water	Aug. /62	8							
		July /63	8							
		July /64	24							
SL 144.8	Dupont Bathing Beach	July /64	70							
SL 145.81	Point Pleasant Water Works intake - raw water	July /64	36							
		July /64	0							
		July /64	2							
		July /64	0							

TABLE II

Sample Point No.	Description	Date	N I T R O G E N A S N				P H O S P H O R U S	
			Free Ammono- nia	Total Kjel- dahl	Nit- rite	Nit- rate	as PO ₄	
							Total	Soluble
SL 9.9R 0.8	Raisin River at Hwy. 401 -0.8 miles from mouth (yearly average)	1964	0.14	0.86	0.00	trace	0.35	0.22
SL 22.92	St. Lawrence Park - Bathing Area	Sept.30/64	0.08	0.33	0.00	0.00	0.16	0.14
SL 73.5	St. Lawrence River - Johnstown-opposite McAulley's Motel	Aug. 8/64	0.30	0.90	0.00	0.00	0.22	----
		Sept.29/64	trace	0.06	0.01	0.00	0.08	----
SL 87.3	Brockville - East Limit - Davis Motel Dock	Aug. 12/64	0.06	0.58	0.00	0.00	0.16	0.06
		Sept.29/64	0.00	0.20	0.00	0.00	0.08	0.08
SL 121.3G	Gananoque River at Hwy. #2-0.3 miles from mouth of river	Aug. 12/64	0.06	0.90	0.00	0.00	0.26	0.14
		Sept.30/64	0.08	0.64	0.00	0.00	0.20	0.18
		Nov. 30/64	0.10	0.70	trace	0.00	0.16	0.03
SL 140C 0.5	Catarauqui River at Hwy. #2-0.5 miles from mouth of river	Aug. 6/63	0.19	0.52	0.00	0.00	----	----
		Aug. 11/64	0.13	0.46	0.00	0.00	0.14	0.04
		Sept.29/64	trace	0.26	0.00	0.00	0.12	0.04
		Nov. 30/64	0.20	0.90	trace	trace	0.32	0.16
SL 144.1 CC 1.2	Catarauqui Creek at Hwy. #33	Aug. 11/64	0.32	1.80	0.00	trace	0.48	0.22
		Sept.29/64	0.38	1.10	0.00	0.00	0.54	0.38
		Nov. 30/64	0.10	0.70	trace	0.15	0.21	0.14

TABLE III

MUNICIPAL WATER WORKS - RAW WATER

<u>Date Sampled</u>	<u>1962</u>					<u>SL_142.0W</u>	<u>Turbidity Units</u>
	<u>Hardness as CaCO₃</u>	<u>Alkalinity as CaCO₃</u>	<u>Iron as Fe</u>	<u>Chloride as Cl</u>	<u>pH at Lab.</u>	<u>Colour in Hazen Units</u>	
Jan. 8	116	90	0.05	25	8.1		
Feb. 5	136	96	0.27	26	8.0		
Feb. 19	132	98	0.16	23	8.1		
Mar. 5	132	98	0.10	25	7.9	< 5	1.1
Mar. 20	120	98	0.10	26	7.9	< 5	1.7
Apr. 2	126	96	0.13	26	8.2		
Apr. 16	126	96	0.10	23	8.0		
Apr. 30	126	100	0.22	23	8.2		
May 14	126	98	0.13	22	8.0		
May 31	126	102	0.20	21			
June 10	140	96	0.08	21			
June 25	136	94	0.05	24	7.9		
July 9	138	98	0.05	24			
July 28	138	100	0.20	25			
Aug. 7	130	100	0.07	26			
Aug. 20	130	100	0.17	26			
Sept. 4	128	100	0.05	24			
Sept. 17	128	94	0.10	28			
Oct. 1	136	96	0.10	27			
Oct. 15	128	94	0.10	25			
Oct. 29	134	96	0.10	30			
Nov. 12	130	90	0.27	34		< 5	1.1
Nov. 26	134	96	0.10	27		< 5	1.8
Dec. 10	128	94	0.16	23		< 5	2.1
Average	130	97	0.13	25		< 5	1.5
Minimum	116	90	0.05	30			1.1
Maximum	140	102	0.27	21			2.1

TABLE III (cont'd)

CITY OF KINGSTON

<u>Date Sampled</u>	<u>1963</u>				<u>SL_142.0W</u>		
	<u>Hardness as CaCO₃</u>	<u>Alkalinity as CaCO₃</u>	<u>Iron as Fe</u>	<u>Chloride as Cl</u>	<u>pH at Lab.</u>	<u>Apparent Colour Units</u>	<u>Turbidity Units</u>
Jan. 8	150	96	0.24	23	8.2	< 5	2.1
Jan. 21	134	98	0.16	25	8.0	< 5	1.7
Feb. 5	136	96	1.12	28	8.0	< 5	2.7
Mar. 4	134	100	0.13	26	8.0		
May 5	128	92	0.16	23	8.1	< 5	2.1
June 4	130	100	0.05	26	8.1	< 5	1.3
July 2	132	102	0.22	20	7.8		
Aug. 7	128	102	0.18	28	8.4	5	2.3
Sept. 3	130	98	0.12	36	8.2	< 5	0.6
Oct. 7	124	98	0.22	21	8.1	< 5	0.8
Nov. 4	130	98	0.18	24	8.2	< 5	1.7
Dec. 3	136	98	0.10	26	8.3	< 5	1.0
Average	133	98	0.24	26		< 5	1.6
Minimum	124	92	0.05	20		< 5	0.6
Maximum	150	102	1.12	36		5	2.7

TABLE III (cont'd)

CITY OF KINGSTON

<u>Date Sampled</u>	1964					<u>SL 142.0W</u>	
	<u>Hardness as CaCO₃</u>	<u>Alkalinity as CaCO₃</u>	<u>Iron as Fe</u>	<u>Chloride as Cl</u>	<u>pH at Lab.</u>	<u>Apparent Colour Units</u>	<u>Turbidity Units</u>
January	140	98	0.18	29	8.1	5	1.1
February	138	100	0.05	26	8.0	5	1.3
March	134	102	0.10	26	7.8	5	1.7
April	132	94	0.05	21	8.3	5	3.1
May	132	104	0.13	17	8.2	5	2.3
June	136	100	0.21	24	7.8	5	1.8
July	184	164	0.30	3	7.4	15	1.0
August	130	96	0.38	26	7.9		
September	130	92	0.19	27	8.4		
October	142	96	0.20	26	8.2		
November	144	94	0.20	25	8.2		
Average	140	104	0.18	23		5	1.8
Minimum	130	92	0.05	3		5	1.0
Maximum	184	164	0.38	29		15	3.1

TABLE III

TOWNSHIP OF AUGUSTA

DUPONT OF CANADA (MAITLAND WORKS) WATER WORKS INTAKE

<u>Date Sampled</u>	<u>Hardness as CaCO₃</u>	<u>Alkalinity as CaCO₃</u>	<u>1962</u>		<u>pH at Lab.</u>	<u>SL_80.2W_</u>	
			<u>Iron as Fe</u>	<u>Chloride as Cl</u>		<u>Colour in Hazen Units</u>	<u>Turbidity Units</u>
Jan. 8	118	94	0.00	27	8.0		
Jan. 22	118	90	0.10	26	7.8	< 5	3.1
Feb. 5	144	90	0.27	29	7.9	< 5	12.5
Feb. 19	136	98	0.10	24	8.0	< 5	1.7
Mar. 5	134	94	0.24	25	8.1	< 5	1.4
Mar. 19	132	100	0.32	26	7.9	< 5	0.8
Apr. 12	128	96	0.27	24	8.1	< 5	1.8
Apr. 16	122	98	0.24	26	8.0	< 5	4.0
May 1	136	96	0.24	25	8.0	< 5	1.4
May 5	122	94	0.22	22	8.0	< 5	5.0
May 29	124	94	0.13	22	8.2	< 5	2.3
June 11	140	94	0.00	22	8.2	< 5	0.8
June 25	144	96	0.00	24	7.9	< 5	1.1
July 16	134	100	0.05	27	7.9	< 5	2.0
Aug. 13	132	96	0.07	26	7.8	< 5	1.8
Sept.	128	100	0.16	24		< 5	3.5
Oct.	130	92	0.70	30		< 5	1.3
Average	130	96	0.19	25		< 5	2.7
Minimum	118	90	0.00	22		< 5	0.8
Maximum	144	100	0.70	30		< 5	12.5

TABLE III (cont'd)

TOWNSHIP OF AUGUSTA1964SL 80.2W

<u>Date Sampled</u>	<u>Hardness as CaCO₃</u>	<u>Alkalinity as CaCO₃</u>	<u>Iron as Fe</u>	<u>Chloride as Cl</u>	<u>pH at Lab.</u>	<u>Apparent Colour Units</u>	<u>Turbidity Units</u>
Mar. 11	132	100	0.00	27	7.5	<5	3.3
Apr. 14	126	98	0.00	23	8.1	5	3.6
May 12	126	96	0.16	24	7.4		
June 8	134	102	0.75	25	8.5	<5	1.7
Aug. 5	128	94	0.20	24	8.2		
Sept. 9	132	92	0.40	27	8.3	<5	2.5
Nov. 11	140	96	0.30	26	7.9		
Nov. 24	140	96	0.22	27	8.2		
Dec. 15	134	98	0.22	26	8.2		
Average	132	97	0.25	25		<5	2.8
Minimum	126	92	0.00	23		<5	1.7
Maximum	140	102	0.75	27		5	3.6

TABLE III

CITY OF CORNWALL

LAKE ST. LAWRENCE - MUNICIPAL WATER WORKS INTAKE

1962

SL 28.95W

<u>Date Sampled</u>	<u>Hardness as CaCO₃</u>	<u>Alkalinity as CaCO₃</u>	<u>Iron as Fe</u>	<u>Chloride as Cl</u>	<u>pH at Lab.</u>	<u>Colour in Hazen Units</u>	<u>Turbidity Units</u>
Jan. 8	118	94	0.05	25	8.1		
Jan. 22	120	96	0.16	27	7.6		
Feb. 26	136	96	0.16	25	7.9	<5	0.8
Mar. 5	134	98	0.10	23	8.0	<5	1.1
Mar. 19	132	96	0.22	26	7.9	<5	0.6
Apr. 16	116	92	0.13	24	7.9	5	1.5
Apr. 30	126	94	0.22	23	8.2	<5	1.7
May 14	128	94	0.20	28	8.1	<5	1.5
May 28	124	98	0.22	22	8.1	<5	1.8
June 11	130	92	0.10	21	8.1	5	1.0
Oct. 29	128	94	0.10	30	8.1	5	0.7
Average	127	94	0.15	25		<5	1.2
Minimum	116	86	0.10	21		<5	0.7
Maximum	136	98	0.22	30		5	1.8

TABLE III (cont'd)

CITY OF CORNWALL

<u>Date Sampled</u>	<u>Hardness as CaCO₃</u>	<u>Alkalinity as CaCO₃</u>	<u>1963</u>		<u>pH at Lab.</u>	<u>SL 28.95W</u>	
			<u>Iron as Fe</u>	<u>Chloride as Cl</u>		<u>Colour in Hazen Units</u>	<u>Turbidity Units</u>
Jan.	134	100	0.15	25	8.1	<5	1.1
Mar.	130	86	0.00	25	8.0	<5	1.4
Mar.	134	98	0.10	26	8.0	<5	0.6
Apr. 8	118	92	0.24	22	8.7	<5	2.6
Apr. 22	126	92	0.20	24	7.8	<5	2.0
May 6	132	90	0.09	24	7.0	<5	1.5
May 20	126	96	0.12	23	7.8	<5	0.7
June 3	118	94	0.08	23	8.1	<5	0.7
June 17	122	90	0.05	22	6.6	<5	0.8
July 2	126	96	0.19	21	7.8	<5	1.1
July 15	128	98	0.15	26	7.9	5	5.0
July 26	132	102	0.40	25	7.8	10	2.6
Aug. 19	122	92	0.22	26	8.2	<5	2.3
Sept. 3	124	100	0.35	23	7.9	<5	2.0
Sept. 16	116	98	0.25	40	7.9	<5	1.8
Sept. 30	124	94	0.40	24	7.2	<5	2.6
Oct. 15	126	98	0.15	26	7.8	<5	1.3
Oct. 28	128	102	0.27	26	8.1	<5	2.0
Nov. 12	132	100	0.18	26	8.1	<5	1.1
Nov. 25	134	98	0.21	24	7.8	<5	2.5
Dec. 9	132	96	0.32	26	8.2	<5	1.8
Dec. 23	130	94	0.50	27	8.2	<5	1.4
Average	127	96	0.21	25		<5	1.8
Minimum	116	86	0.00	21		<5	0.6
Maximum	134	102	0.50	40		10	5.0

TABLE III (cont'd)

CITY OF CORNWALL1964SL 28.95W

<u>Date Sampled</u>	<u>Hardness as CaCO₃</u>	<u>Alkalinity as CaCO₃</u>	<u>Iron as Fe</u>	<u>Chloride as Cl</u>	<u>pH at Lab.</u>	<u>Colour in Hazen Units</u>	<u>Turbidity Units</u>
Jan. 6	140	100	0.05	27	8.1	<5	0.8
Feb. 3	134	96	0.12	24	7.8	<5	1.0
Feb. 16	134	100	0.22	26	8.2	<5	0.8
Mar. 2	150	102	0.05	26	8.1	<5	2.6
Mar. 16	132	98	0.30	26	8.5	<5	2.1
Apr. 13	126	94	0.11	23	8.1	<5	3.6
May 11	124	96	0.37	23	8.1	<5	4.5
May 25	128	98	0.12	23	8.2	<5	2.3
June 8	130	100	0.25	24	8.2	<5	3.1
June 22	134	96	0.25	26	8.1	<5	1.5
July 6	140	96	0.30	24	8.0	<5	3.6
July 20	136	96	0.32	25	8.0	<5	3.5
Aug. 3	136	94	0.36	25	8.0	<5	4.0
Aug. 31	134	94	0.34	28	8.0	<5	6.0
Sept. 25	132	94	0.28	27	8.2	<5	2.1
Oct. 13	136	94	0.23	26	8.3	<5	2.8
Oct. 26	130	94	0.15	27	8.3	<5	2.6
Average	133	97	0.22	25		<5	2.8
Minimum	124	94	0.05	22		<5	0.8
Maximum	140	102	0.37	28		5	6.0

TABLE IV

TOTAL ST. LAWRENCE RIVER FLOW - cfs - SAUNDERS DAM

(As reported by H.E.P.C.)

<u>MONTH</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>
January	210,231	208,910	210,590
February	207,401	206,800	206,379
March	203,625	195,936	192,825
April	190,111	189,002	179,223
May	195,790	187,998	184,009
June	211,720	206,423	195,777
July	213,449	214,084	200,631
August	215,693	216,530	206,706
September	214,974	212,253	207,232
October	210,412	211,731	205,464
November	207,210	205,341	199,546
December	209,723	209,432	192,721
AVG. MONTHLY	207,528	205,370	198,425
MAX. DAILY	217,777 Sept. 7	234,323 Feb. 1	216,241 Jan. 3
MIN. DAILY	177,809 Apr. 1	172,988 Mar. 30	164,991 Apr. 5
AVG. FLOW - 3 year period	203,774		

TABLE V

MAJOR WATER WORKS SYSTEMS EMPLOYING ST. LAWRENCE RIVER WATER

<u>MUNICIPALITY</u>	<u>Capacity mgd</u>	<u>I N T A K E</u>		<u>TYPE OF TREATMENT</u>
		<u>Diameter inches</u>	<u>Length feet</u>	
<u>Twp. of Charlottenburgh</u> - St. Lawrence Sanatorium	0.14	---	75	Pressure filtration, chlorination
<u>City of Cornwall</u> - Municipal	10.00			Coagulation, settling, filtration, chlorination, fluoridation
- Robert Saunders Generating Station	0.005			Cuno micro filter, chlorination
<u>Twp. of Cornwall</u> - Long Sault	0.69	14	600	Chlorination
<u>Twp. of Osnabruck</u> - Ingleside	1.08	16	3,335	Chlorination
<u>Village of Morrisburg</u> - Municipal	1.1	18	325	Chlorination
<u>Village of Iroquois</u> - Municipal	0.6	24	4	Chlorination
<u>Village of Cardinal</u> - Canada Starch Co.	4.32	24 24		Pressure filtration, chlorination
<u>Town of Prescott</u> - Municipal	3.0	24 & 12	200	Chlorination, fluoridation

TABLE V (cont'd)

<u>Twp. of Augusta</u>				
- Dupont Maitland	80.87	48	7	Chlorination
- Brockville Chemical	2.8	48		Rapid sand filtration, chlorination, activated carbon pressure filtration
<u>City of Brockville</u>				
- Municipal	10.0	36	960	Micro straining, chlorination
<u>Town of Gananoque</u>				
- Municipal	1.4	12	1,100	Chlorination, taste & odour control
<u>Twp. of Pittsburgh</u>				
- Sweezey	0.7	4	175	Chlorination
- Glen Lawrence	0.1	2	80	Chlorination
- Pier's		2	80	Chlorination
<u>City of Kingston</u>				
- Municipal	10.0	30	1,200	Coagulation, settling, filtration chlorination
- Penitentiary	2.08	8	600	Chlorination
<u>Twp. of Kingston</u>				
- Dupont of Canada Ltd.	25.0	36 20	1,700	Chlorination
- Pt. Pleasant	1.4	10 16	700	Chlorination

TABLE VI

MAJOR CENTRES OF POPULATION AND INDUSTRIES

DISCHARGING WASTES DIRECT TO THE ST. LAWRENCE RIVER

<u>MUNICIPALITY</u>	<u>AVERAGE DAILY SEWAGE FLOW mgd</u>	<u>PLANT CAPACITY mgd</u>	<u>Dia. in.</u>	<u>Length feet</u>	<u>Depth feet</u>	<u>TREATMENT PROVIDED</u>
<u>Twp. of Charlottenburgh</u>						
- St. Lawrence Sanatorium	--	0.005	--	--	--	Septic tank
<u>City of Cornwall</u>						
- Seaway International Bridge Corp.	0.001	0.005 U.S.	--	--	--	Modified activated sludge process with final sett- ling, chlorination, sludge digestion,
- Municipal	7.0*					NIL
- Courtaulds Can. Ltd.	10.0	--	--	--	--	
- Domtar	45.0	--	--	--	--	
<u>Twp. of Cornwall</u>						
- Long Sault	0.1*	0.3	15	265	5	Activated sludge pro- cess with primary & final settling, chlori- nation, sludge digestion
<u>Twp. of Osnabruck</u>						
- Ingleside	0.07	0.3	6	3900	--	Primary settling, chlo- rination, sludge digestion
<u>Twp. of Williamsburgh</u>						
- Seaway Chemicals Ltd.	0.001	0.003	--	--	--	Modified activated sludge process with final sett- ling, chlorination
<u>Village of Morrisburg</u>	0.4	0.5	24	900	25	Primary settling, sludge digestion, chlorination

TABLE VI (cont'd)

<u>Village of Iroquois</u>						
- Municipal	0.5	0.45	18	--	--	Primary settling, chlorination, sludge digestion
<u>Village of Cardinal</u>						
- Municipal	7.2	0.08	--	--	--	2 septic tanks
<u>Town of Prescott</u>						
- Municipal	0.6	--	--	--	--	NIL
<u>Twp. of Augusta</u>						
- Dupont Maitland	33.7	57.617	60	450	25	Primary settling, chlorination
- Brockville Chemical	0.0114	0.006	--	--	--	Modified activated sludge process with final settling
<u>City of Brockville</u>						
- Municipal	3.0	3.75	30 36	320 160	10	Primary settling, chlorination, sludge digestion
<u>Twp. of Front of Yonge</u>						
- Mallorytown Landing Park	0.007	0.014	--	--	--	Modified activated sludge process with final settling, chlorination
<u>Twp. of Front of Leeds and Lansdowne</u>						
- Mana-to-ana Motel	--	0.009	--	--	--	Modified activated sludge process with final settling, chlorination
<u>City of Kingston</u>						
- Municipal	10.0	9.0	42	600	42	Primary settling, sludge digestion
<u>Twp. of Kingston</u>						
- Municipal	0.4	0.83	36	3066	--	Activated sludge process with primary & final settling, chlorination, sludge digestion
- Dupont	9.6	--	--	--	--	Sanitary waste to municipal sewage treatment plant -inplant control of process wastes
<u>* Estimated</u>						

